46. The laser module of claim 33 wherein the optical fiber includes a fiber Bragg grating.

47. The laser module of claim 46 wherein the fiber Bragg grating has a reflectivity greater than 6% and wherein a first portion of back-reflected light is coupled into the laser diode and a second portion of back-reflected light is coupled into the monitor photo diode.

REMARKS

Claims 33-44 stand rejected and claims 45-47 are added, thus claims 33-47 are pending. Claims 33 and 42 are amended to more particularly point out the invention. The language of claim 33 is amended to more clearly indicate the relationship between the front facet, fiber end, and coupling region. Claim 42 is amended to further recite a fiber Bragg grating in the optical fiber. Support for this amendment is found in the Written Description in paragraphs 108 and 111. Support for new claim 45 is found in the Written Description in paragraph 111, and support for new claims 46 and 47 is found in the Written Description in paragraph 114. The undersigned believes these amendments and new claims do not add new matter.

Rejections under 35 U.S.C. § 102(b)

Claims 33-39 stand rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 4,165,496 by Di Domenico, Jr., et al. (hereinafter "Di Domenico"). The Examiner cites Di Domenico for disclosing a fiber end disposed proximate to the front facet, and the front facet and fiber end forming a coupling region there between, with a photo monitor diode disposed to couple light from at least one of the fiber end and the front facet. The Applicants respectfully traverse the Examiner's position.

Claim 33, as amended, recites, among other elements, that the fiber end is disposed to form a coupling region between the fiber end and the front facet of the laser diode. The endface (Di Domenico, Fig. 1, ref. num. 13) that the Examiner refers to is not

equivalent to the recited fiber end. The endface **13** is described as being about 80 meters from the injection laser (Di Domenico, Fig. 2, ref. num. **28**) (Col. 4, line 57), and does not form the recited coupling region between the fiber end and the front facet of the laser diode. Similarly, the photo diode **15** disclosed in Di Domenico is shown as coupling light from the endface **13**, and is not disposed to couple light from either the front facet or the fiber end, as recited in claim 33.

Furthermore, the Applicants respectfully direct the Examiner's attention to Fig. 6 of Di Domenico, which shows a package assembly for the beamsplitter and photo-detector. Di Domenico states that "a light source such as a laser is coupled to one of the fibers" (Col. 5, lines 50-51) of the beamsplitter/photo-detector package assembly. Thus it appears that the beamsplitter/photo-detector of Di Domenico is not even included in a laser module, but is intended to be in a separate package. Since Di Domenico states that the separation of the detector from the laser by a long length of fiber provides a substantially constant modal distribution of light entering the beamsplitter (Col. 4, lines 41-62), Di Domenico teaches away from the present invention. Di Domenico cannot even be modified to arrive at the present invention without fundamentally changing the nature and operation of the device disclosed therein.

Accordingly, the Applicants believe that claim 33 is not anticipated or suggested by the cited reference, and that claim 33 and all claims that depend from claim 33 are allowable.

Claim 34, which depends from claim 33, recites that the photo diode is disposed adjacent to the coupling region. Di Domenico does not disclose or suggest a photo diode disposed adjacent to the coupling region; therefore, claim 34 is further allowable.

Claim 35, which depends from claim 33, recites that the photo diode is disposed to couple light from the fast axis of the aperture in the front facet of the laser diode. Claim 36 recites that the photo diode is disposed to couple light from the slow axis of the aperture. Since the photo-detector disclosed in Di Domenico couples light from the fiber beamsplitter, and not from the fast or slow axes of the aperture of the laser diode, claims 35 and 36 are not disclosed or suggested, and the Applicants believe claims 35 and 36 are further allowable.

Claim 40, which depends from claim 33, recites that the laser diode and the optical fiber are mechanically coupled to a substrate, and that the monitor photo diode is disposed between the coupling region and the substrate. As discussed above in support of claim 33, the optical fiber having the endface 13 disclosed in Di Domenico and cited by the Examiner appears to be on a fiber that is in a separate beamsplitter package, and not mounted to the same substrate as the laser diode. Therefore, the Applicants believe claim 40 is further allowable.

Rejections Under 35 U.S.C. § 103

Claim 42 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 4,807,956 by Tournereau et al. (hereinafter "Tournereau") in view of U.S. Patent No. 5,940,557 by Harker (hereinafter "Harker"). The Examiner cites Tournereau for reciting all the elements in claim 42 except a lens edge that is not perpendicular to the center axis of the optical fiber, and cites Harker for disclosing a lens edge that is not perpendicular to the center axis of the optical fiber.

Claim 42, as amended, recites, among other elements, that the optical fiber includes a fiber Bragg grating ("FBG") providing back-reflected light to the laser cavity. As explained in paragraph 108 of the Written Description, light reflected from a FBG back into the laser diode can cause the laser diode to operate in the coherence collapse regime, thus serving to stabilize the frequency of operation of the laser. Harker states that the arrangement of the microlens disclosed therein substantially eliminates any back reflection to the laser diode (Col. 4, lines 29-30), which prevents spectral instability of laser diodes (Col. 4, lines 60-67). Therefore, Harker teaches away from using a FBG.

The Applicants realized that one could use a FBG to reflect light of the selected wavelength back to the laser diode, amplify the back-reflected light with the laser diode, and provide the amplified back-reflected to the laser monitor. Detection of the amplified back-reflected light at the back facet of the laser diode could then at least partially compensate for optical feedback from a varying secondary Fabry-Perot cavity (*i.e.* the cavity between the front facet of the laser diode and the optical fiber end) (*see* Written Description, paragraph 111) and reduce tracking error arising from the secondary Fabry-

Perot cavity phasing with the laser cavity (*see generally*, Written Description, paragraphs 9-10 and 107). Therefore, the Applicants believe that claim 42 is allowable, as are all claims that depend from claim 42.

Version of Amended Text Showing the Changes Made

The following marked-up claims show the changes made to arrive at the substitute and new claims shown above:

33. [AMENDED] A laser module comprising:

a laser diode having a front facet;

an optical fiber having a fiber end disposed **[proximate]** to form a coupling region between the front facet and the fiber end to couple light emitted from the front facet to the optical fiber**[, the front facet and the fiber end forming a coupling region there between]**; and

a monitor photo diode disposed to couple light from at least one of the fiber end and the front facet.

42. [AMENDED] A laser package with reduced tracking error, the laser package comprising:

a laser diode source having a laser cavity between a front facet and a back facet,

an optical fiber having an angled chisel lensed fiber input end disposed proximate to the front facet of the laser diode source to receive a first light output from the front facet, the angled chisel lensed fiber input end having a lens edge that is not perpendicular to a center axis of the optical fiber, and the optical fiber including a fiber Bragg grating providing back-reflected light to the laser cavity; and

a laser monitor disposed proximate to the back facet of the laser diode source to receive a second light output from the back facet, the second light output including amplified back-reflected light.

45. [NEW] The laser package of claim 42 wherein the fiber Bragg grating has a reflectivity greater than a cavity reflectivity of the front facet of the laser diode.

46. [NEW] The laser module of claim 33 wherein the optical fiber includes a fiber Bragg grating.

47. [NEW] The laser module of claim 46 wherein the fiber Bragg grating has a reflectivity greater than 6% and wherein a first portion of back-reflected light is coupled into the laser diode and a second portion of back-reflected light is coupled into the monitor photo diode.

Conclusion

In view of the foregoing, the Applicants believe all claims pending in this Application are in condition for allowance, and that the Applicants are entitled to the claims in accordance with the Title 35 of the United States Code and Art.1, §8, cl.8 of the Constitution of the United States. The Applicants respectfully request reconsideration of all pending claims, the withdrawal of all rejections, and the issuance of a formal Notice of Allowance at an early date.

If the Examiner believes this amendment does not put all pending claims in condition for allowance, the undersigned invites the Examiner to telephone the undersigned at (707) 591-0789.

Respectfully submitted,

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